Alexei Svizhenko ,

Ph.D, Electrical Engineering

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Areas of Expertise

- Solid State and Semiconductor Physics
- Solid State Device Physics and Modeling
- Novel Nanostructures and Quantum Devices
- Quantum, Semiclassical and Drift-Diffusion Transport Models
- Non-Linear Optics and Optoelectronics
- Noise Theory
- Parallel Supercomputing

Computer Skills

FORTRAN 77/90, C/C++, OpenMP Parallelization, UNIX, Linux, Windows 98, Matlab, Maple, LaTeX, HTML

Numeric Skills

finite difference, finite element, Monte Carlo technique, solution of self-consistent NEGF - Poisson, solution of linear and non-linear differential equations.

Education

- Ph.D., Electrical Engineering - University of Nebraska**,** Lincoln, NE - January 1999
- M.Sc. - Moscow Institute of Physics and Technology**,** Moscow, Russia - May 1995
- B.Sc. - Moscow Institute of Physics and Technology**,** Moscow, Russia - May 1993

Work Experience

Postdoctoral Research Associate
April 1999-present

Integrated Product Team on Devices and Nanotechnology, (Manager: M. Meyyappan)
NASA Ames Research Center, CA 94035

- Developed a code and physical models for 2D Quantum Simulator of Semiconductor and Molecular Structures and Devices using Non Equilibrium Green's Function Approach

Status of the current project: 2D quantum simulator for nanoscale MOSFET
Typical devices are MIT 25 , 50 and 90 nm "well tempered" MOSFETs. The model is based on a self-consistent solution of Poisson and NEGF equations, which in the absence of scattering is equivalent to Schroedinger equation with open boundaries. Oxide tunneling, anisotropy of the effective mass and acoustic phonon scattering are taken into account. As compared to classical models with quantum corrections, our model consistently gives higher threshold voltages and higher drive currents, which shows the importance of quantum effects. The simulator uses non-uniform spatial and energy grids. The code is parallelized for SGI Origin 2000 using OpenMP directives.

Graduate Research Associate
January 1996 - March 1999

Quantum Device Laboratory
(Director and supervisor : S. Bandyopadhyay)
Electrical Engineering Department,
University of Nebraska-Lincoln, NE 68588

- Developed a Monte Carlo code to study the effect of phonon confinement on hot carrier magnetotransport and fluctuation noise in sub-micron devices and quantum wires.
- Introduced the concept of phonon and noise engineering and theoretically showed that acoustic phonon confinement and/or external magnetic field should drastically decrease noise in quantum wires which may be used for low-noise field effect transistors
- Proposed a new mechanism of optical non-linearity in quantum wires due to breaking of inversion symmetry and creation of giant dipole effect by an external magnetic field

Teaching Assistant
September 1997 - December 1997

Department of Electrical Engineering,
(professor A. Kriman)
University of Notre Dame, IN 46556

- Conducted recitations and grading of Electromagnetics I

Graduate Research Assistant
September 1993 - December 1995

Department of Solid State Electronics,
(Head: O. Sarbey)
Institute of Physics,
Ukrainian National Academy of Sciences,
Kyiv, Ukraine

- Conducted theoretical and experimental study optical nonlinearities due to inter-valley redistribution in many-valley semiconductors induced by laser pulse

Research Assistant

Department of Optoelectronics,

September 1992 - May 1993	(Head: I. Kompanets) Lebedev Physical Institute, Russian Academy of Sciences, Moscow, Russia

- Conucted experimental study of optoelectronic properties of smectic liquid crystals with sub-10 μsec switching time

Professional Affiliations

- The American Physical Society (APS)
- Institute of Electrical and Electronics Engineers (IEEE)
- The Electrochemical Society (ECS)
- Sigma Xi

Professional Schools and Workshops attended

- Third NASA Device Modeling Workshop (NASA, MIT, SRC), Moffett Field, 1999
- Self-Assembly for Nanoelectronics Workshop (NASA), Moffett Field, 1999
- Computational Astrobiology Workshop (NASA), Moffett Field, 1999
- Simulation of Nanoscale Devices (ECS, UIUC), Montreal, Canada, 1997
- Superconducting Thin Films (MISCON), Notre Dame, 1996
- NATO ASI on Devices Based on Low-Dimensional Semiconductor Structures, Sozopol, Bulgaria, 1995
- NATO ASI on Frontiers in Nanoscale/Submicron Science, Kyiv, Ukraine, 1995